

# A VERTICAL-FLUE HAYDRIER

**Since Extension Circular 149 was published, the vertical-flue haydrier has been introduced, tested, and proved highly satisfactory. It operates on the same principle as the driers described in the circular, but handles hay at a greater depth in the mow.**

**This leaflet, a supplement to Extension Circular 149, describes and shows a plan for the vertical-flue haydrier.**

JOHN B. DOBIE  
and  
RALPH R. PARKS

A HAYDRIER CAN help you produce better livestock feed. The equipment makes it possible to get hay ready for storage while it is still tough and will retain its leaves and color. Dairymen find that their cows like this leafy, green, dust-free feed. Less dust also means better satisfied hired help.

## **What is a vertical-flue haydrier?**

It is a drier similar to those described in Extension Circular 149, but it is designed to permit drying of hay at greater depth in the mow. By use of flue formers, air passages are made through the hay. These permit ventilation of the upper part of the stack that may be as much as 25 feet high.

## **Why is barn drying good insurance?**

Chopped hay often heats spontaneously unless it is very dry when stored. A haydrier will keep damp hay cool while it is drying in storage to a safe moisture content. This is true even if the moisture

content of the hay was as high as 35 per cent when it was stored. A 5-horsepower fan is large enough to do this drying in a 30-by-50-foot barn.

## **Can I make hay in two days?**

Yes, this is possible in midsummer if you farm in central California or in an area with similar climate, provided you use a haydrier.

Farmers using this equipment mow their hay on the morning of the first day so that it will receive a good wilting. The next day, they windrow the hay early enough in the morning so that the leaves will not shatter off. Field drying is completed this second day. On the morning of the third day—just two complete days after cutting—the hay is chopped into the barn. There, the haydrier completes the process. Dew on the hay this final morning will toughen it and help retain the leaves during chopping.

Even in dry areas, an extra day of field drying may be needed for spring and fall cuttings. In coastal areas, three or more

days of field curing are needed before the hay is chopped into the barn and the hay-drier started.

**How do I plan a haydrier?**

You need three things: a fan, power, and a duct system. As soon as you determine your requirements, locate your fan. Next, make arrangements for the power to run it. Then start building the duct system.

If the area of your barn is:	You need a fan of:	Delivering up to:	At a static pressure of:
sq. ft.	hp.	c.f.m.	inches of water
less than 1,125 . . . . .	3	16,900	1¼
1,125 to 1,500 . . . . .	5	22,500	1¼
1,501 to 1,600 . . . . .	7½	24,000	1¼
1,601 to 2,250 . . . . .	10	34,000	1¼

If you have a barn large enough to require more than a 5-hp. fan, you will find it to your advantage to consider two 3-hp. fans instead of one 7½-hp., or two 5-hp. fans instead of one 10-hp. These fans may either be placed side by side at one end of the main duct, or at opposite ends. If there is a fan at each end, the haydrier may be operated as two separate units by placing a door across the center of the duct.

**What is static pressure?**

Static pressure is the resistance to flow of air through the hay. So long as you follow normal management practice, you need not be concerned with it, except in specifying a suitable fan.

**What shall I use for power?**

Most farmers will find it best to use an electric motor. If three-phase power is available, a unit of any size may be used. If only single-phase power is available, local regulations will determine the maximum size of blower you can use. Check with your local power company to make arrangements for service. Always provide proper overload protection for your electric motor.

**What size fan will I need?**

First, measure the length and width of your hay storage space. Multiply these two figures to get the area. The height makes no difference unless it is over 25 feet. Plan to have 15 cubic feet of air per minute per square foot of storage area. Then specify a fan to deliver that amount of air at a pressure of 1¼ inches of water. This simple table will fit most cases:

In some instances, a tractor-driven unit may be more desirable, provided the tractor can be spared from other work for several days during the drying period.

**Where can I buy a fan?**

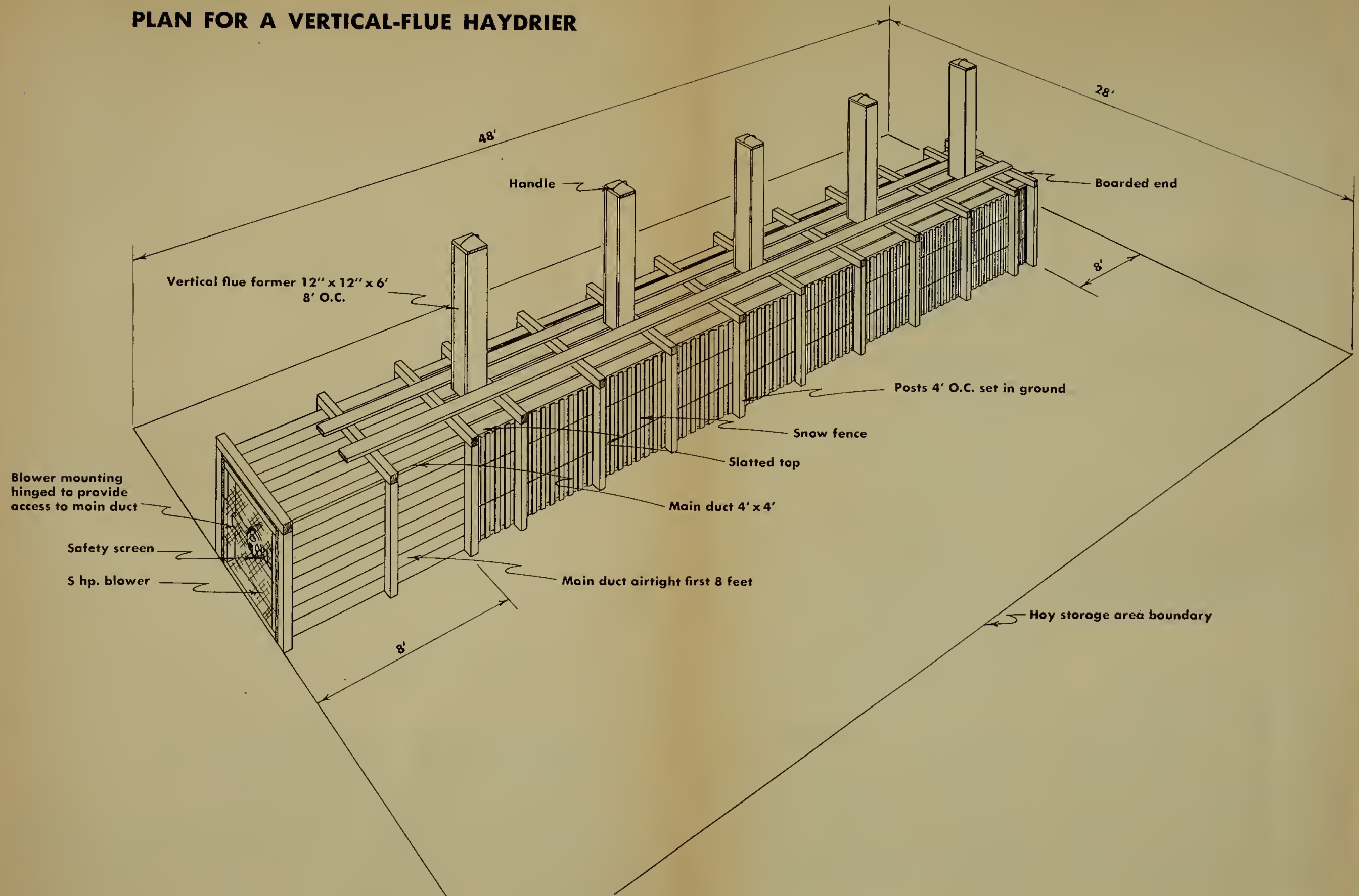
You may be able to buy a fan in your locality from someone who is dismantling a discarded dehydrator. Most of these squirrel-cage fans are quite efficient. However, before you buy, be sure to identify the fan and check the original data sheets to see if the fan will meet your air requirements.

The safest plan is to buy a new fan of known air output. If fans are not available through local dealers, your Farm Advisor can supply you with names and data on two makes of fan now being commonly used in California for hay-drying. The propeller type fan is being used in most installations because it is lower in cost and easier to install than are some other types.

**How do I plan the duct system?**

A vertical-flue system can be used with barns up to 32 feet wide. Barns up to 26 feet in width require only a main duct through the center of the barn, as shown

# PLAN FOR A VERTICAL-FLUE HAYDRIER





in the accompanying plan. Barns wider than 26 feet should have a slatted floor 2 or 3 feet wide on each side of the main duct (see Ext. Cir. 149, p. 7).

The main duct should be 4 by 4 feet, inside dimensions, for a 3-hp. blower, and 4 feet wide by 5 feet high for a 5-hp. unit. A 7½-hp. fan will require a duct 4 by 6 feet, and a 10-hp. fan should have one 5 by 6 feet. The main duct should be slatted, with about 1½-inch air cracks on the sides and 1-inch cracks on the top. Any available material can be used for the sides, such as snow fence or woven wire.

The part of the duct toward the fan should be airtight for 8 feet from the end of the hay. This duct should stop 8 feet from the other end of the hay storage area. Four-by-four posts, or equivalent, should be used every 4 feet along the sides, and the sidewall boards or other material should be nailed on the inside of these posts. The posts may be set into the ground or may be tied together at the bottom to prevent spreading.

Two-by-fours on edge across the top at the posts will support the top of the duct. The top boards should be put on from the under side. Two boards laid lengthwise on top of the crosspieces will take the load off the under-nailed boards. They also hold the flue formers in place until the first hay is packed around them.

### **What about the flue formers?**

The flue formers are made of 1" x 12" surfaced boards nailed together to make a box 1' x 1' x 6'. A rope or strap handle is fastened to one end. Holes 11 inches square are cut in the top of the main duct, spaced approximately 8 feet apart (see plan). The flue formers are set over these holes and are pulled up through the hay as it is blown into the barn. Hay should be tramped down around the flue formers

to reduce air leakage. A stick should be bolted to one corner of each former, as shown in the plan, to keep it from slipping back down the hole.

### **How can I check moisture content?**

With practice, you can estimate moisture content, just as you do with dry hay. At 30 to 35 per cent moisture content, the exposed leaves will be dry and shattering, but the stems will be tough and pliable. Most Farm Advisors have moisture testing kits, and will help you get started. If you wish, you can obtain satisfactory field moisture testing equipment at a reasonable cost. One method is given in Extension Circular 149, page 15. It may be best to avail yourself of the Farm Advisor's services for the first season.

### **Does a haydrier require special management?**

Management of a haydrier is very simple, and is discussed in Extension Circular 149, page 14. Be sure to cover the full length of the main duct first so that drying can start as soon as possible. Do not operate the fan while filling the barn. Do not put in hay of more than 35 per cent moisture content. If you do get a wet load, spread it out—do not put it all in one spot. Continuous operation is usually best for chopped hay, at least for the first three or four days. If more drying is required, daytime operation should be sufficient. In central California, less than a week should be required to dry the hay, even under unfavorable conditions.

### **Where can I see some haydrying installations?**

Your Farm Advisor has the latest list of installations, and can direct you to those nearby. You can learn much about a drier by seeing it and the wagons, unloading equipment, and quality of hay resulting from this method of handling.

### **The Authors:**

John B. Dobie is Associate Specialist in Agricultural Engineering, Davis.

Ralph R. Parks is Agriculturist in Agricultural Extension, Davis.

---

Supplement to University of California Extension Circular 149, a publication of the College of Agriculture, Berkeley.

Co-operative Extension work in Agriculture and Home Economics, College of Agriculture, University of California, and United States Department of Agriculture co-operating. Distributed in furtherance of the Acts of Congress of May 8, and June 30, 1914 J. Earl Coke, Director, California Agricultural Extension Service.